SECTION 6.3

ARCHITECTURAL COATINGS

(Revised August 1999)

EMISSION INVENTORY SOURCE CATEGORY
Solvent Evaporation / Architectural Coatings and Related Processes

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION

520-520-92##-0000	**(29 codes)**	Water-Based Coatings
520-520-91##-0000	**(34 codes)**	Oil-Based Coatings
520-522-8300-0000	**(46771)**	Cleanup & Thinning Solvents

METHODS AND SOURCES

The methodology described below is used to estimate emissions of total organic gases (TOG) resulting from the use of ***oil-based*** and ***water-based*** architectural and industrial maintenance coatings and the associated use of ***cleanup and thinning solvents***. Only the non-aerosol types of architectural and industrial maintenance coatings are included. Aerosol coatings are covered under the Consumer Products category.

Architectural coatings are coatings applied to stationary structures and their accessories, to mobile homes, pavements, or curbs. Industrial maintenance coatings are high performance coatings formulated for and applied to substrates in industrial, commercial, or institutional situations exposed to extreme environmental conditions (e.g., immersion in water, chronic exposure to corrosive agents, repeated heavy abrasion).

Annual average emission estimates of TOG for the year 1996 were derived from data obtained through a survey of manufacturers of architectural and industrial maintenance coatings conducted by the Stationary Source Division of the Air Resources Board.[1]

The results of the survey showed that 87.5 million gallons of coatings were sold in California in 1996. ***Water-based*** coatings (29 different types) accounted for 82% of the sales, while ***oil-based*** coatings (34 different types) accounted for 18% of the sales.

For each coating category, TOG emissions were estimated by dividing VOC emissions listed in the survey report[1] by the Fraction of Reactive Organic Gases (FROG) derived from chemical composition data obtained from the survey. The statewide average emission factors were then derived by dividing the total statewide amount of TOG emissions by the statewide sales data listed in the survey report.[1]

TOG emissions from ***cleanup and thinning solvents*** were estimated based on the assumption that 1 pint of solvent (with a TOG emission factor of 6,400 pounds per 1,000 gallons) is used per gallon of oil-based coating.[2] ROG emissions are estimated by multiplying the TOG emissions by the appropriate Fraction of Reactive Organic Gases.[3]

Statewide TOG emissions, broken down by coating type, are summarized in Tables I and II. These tables list the EIC and CES codes, category descriptions, process rates, ROG emissions, TOG emissions, and the TOG emission factors. The ARB survey gathered data for 58 types of coatings. However, to protect the confidentiality of the respondents' data, the data in the survey report are only shown where the data are for three or more companies. Consequently, the data for coatings not representing at least three companies are combined into two "Other" categories: one for ***water-based*** paints and one for ***oil-based*** paints. The types of coatings included in these "Other" categories are listed in Table III.

The amounts of coatings sold in the state were apportioned to the counties using population.

ASSUMPTIONS

1. The 1996 emissions from the use of architectural coatings in California can be estimated from data found in the 1998 survey report.[1]

2. The amount of coatings sold is equal to the amount used.

3. Paint cleanup and thinning solvents are used at the rate of one pint per gallon of oil-based coating. [2]

4. Paint cleanup and thinning solvents have a density of 770 g/l.[2] This is equivalent to 6.4 pounds per gallon (or 6,400 pounds per 1,000 gallons).

5. Statewide architectural coatings usage can be apportioned to the counties using population.

CHANGES IN METHODOLOGY

The 1990 emission inventory was based on 1990 sales and VOC emissions data obtained through a survey of architectural coatings manufacturers conducted by the Air Resources Board. The 1996 inventory is based on 1996 sales and emissions data obtained from a more recent survey also conducted by the Air Resources Board. The number of coating categories has also been expanded. Instead of the emissions being summarized into a water-based category and solvent-based category, there are now 29 water-based categories and 34 solvent-based categories.

For the 1990 inventory, the total number of housing units in each county was used to apportion emissions to the counties. For the 1996 inventory, statewide emissions are apportioned to each county based on county population.

COMMENTS AND RECOMMENDATIONS

Little information on the use of cleanup and thinning solvents was obtained from the latest survey. More information will be obtained as part of an upcoming contract. The types of information to be gathered include the specific types and amounts of solvents used, density and emission factors.

DIFFERENCES BETWEEN 1996 AND 1990 EMISSION ESTIMATES

The 1996 TOG emissions from these categories are lower than the 1990 emissions. Emissions from the usage of water-based coatings increased by 9 percent, while emissions from the use of oil-based coatings decreased by 15 percent. Usage of oil-based coatings also decreased, by 14 percent. Usage of water-based coatings increased by 22 percent. The ratio of water-based coatings sales over oil-based coatings sales is 4.57 for 1996 in contrast to 3.22 for 1990. Consequently, sales of cleaning and thinning solvents used in conjunction with oil-based coatings also decreased.

TEMPORAL ACTIVITY

The application of architectural coatings is assumed to be highest during the summer and lowest in the winter. The weekly activity occurs primarily during weekdays. The daily activity occurs primarily during daylight hours.

ADDITIONAL CODES

Category	Growth Code	Control Code	VOC Speciation Profile
Water-Based Ctgs	912	302	1902
Oil-Based Ctgs	911	801	1901
Cleanup/Thinning	911	303	1930

REFERENCES

1. California Environmental Protection Agency, Air Resources Board, 1998 Architectural Coatings Survey Results - Final Report, (September 1999).

2. Air Resources Board, Methods for Assessing Area Source Emissions in California (December 1984).

3. California Environmental Protection Agency, Air Resources Board, Improvement of Speciation Profiles for Architectural and Industrial Maintenance Coating Operations, Contract No. 93-319 (June 1996).

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TABLE I. SOLVENT-BORNE COATINGS AND THINNING/CLEANUP SOLVENTS

STATEWIDE ANNUAL EMISSIONS

1998 Architectural Coatings Survey Summary (as of 2-26-99)							
EIC	CES	Description	Sales (gals)	**Process Rate (1000 gal)**	ROG Emissions (TPY)	**TOG Emissions (TPY)***	**TOG Emission Factor (lbs/1000 gal)**
520-520-9164-0000	85571	Bituminous	1,295,827	1,295.827	919.37	953.11	1471.04
520-520-9165-0000	85589	Concrete curing compounds	11,820	11.820	33.40	34.63	5859.13
520-520-9166-0000	85597	Dry Fog	76,661	76.661	113.24	117.39	3062.67
520-520-9167-0000	85605	Extreme high durability	21,855	21.855	35.48	36.79	3366.34
520-520-9168-0000	85613	Fire retardant - opaque	10,297	10.297	11.47	11.89	2310.19
520-520-9159-0000	85530	Flats	27,837	27.837	43.23	44.81	3219.61
520-520-9169-0000	85621	Floor	493,568	493.568	305.43	316.64	1283.08
520-520-9170-0000	85639	Form release	11,025	11.025	11.36	11.78	2136.92
520-520-9171-0000	85647	High temperature	22,839	22.839	34.83	36.10	3161.65
520-520-9172-0000	85654	Industrial maintenance	3,902,392	3,902.392	5,070.11	5,256.18	2693.82
520-520-9155-0000	85514	Lacquer - clear	445,448	445.448	1,200.00	1,244.04	5585.56
520-520-9156-0000	85522	Lacquer - opaque	180,490	180.490	447.00	463.41	5134.98
520-520-9173-0000	85662	Metallic pigmented	272,965	272.965	513.04	531.87	3897.01
520-520-9161-0000	85548	Nonflats - high gloss	532,033	532.033	813.00	842.84	3168.36
520-520-9163-0000	85563	Nonflats - low gloss	34,373	34.373	48.96	50.75	2952.99
520-520-9162-0000	85555	Nonflats - medium gloss	522,186	522.186	624.54	647.46	2479.82
520-520-9100-0000	46763	Other Coatings	552,285	552.285	819.00	849.06	3074.70
520-520-9105-0000	85399	Primers, Sealers, and Undercoaters	1,515,383	1,515.383	2,160.95	2,240.26	2956.69
520-520-9153-0000	85506	Quick dry - Enamels	904,739	904.739	1,485.00	1,539.50	3403.19
520-520-9106-0000	85407	Quick dry - Primers, Sealers, and Undercoaters	1,076,267	1,076.267	1,928.60	1,999.38	3715.39
520-520-9174-0000	85670	Roof	116,174	116.174	124.08	128.64	2214.54
520-520-9112-0000	85423	Sanding sealers	110,767	110.767	305.89	317.12	5725.88
520-520-9110-0000	85415	Sealers	57,890	57.890	99.31	102.95	3556.73
520-520-9132-0000	85456	Stains - clear	98,297	98.297	166.95	173.08	3521.53
520-520-9136-0000	85472	Stains - opaque	127,373	127.373	195.50	202.68	3182.44
520-520-9134-0000	85464	Stains - semitransparent	909,385	909.385	1,716.49	1,779.48	3913.60
520-520-9175-0000	85688	Swimming pool - repair	12,774	12.774	30.31	31.42	4919.94
520-520-9176-0000	85696	Traffic	885,126	885.126	723.10	749.64	1693.86
520-520-9142-0000	85480	Varnish - clear	445,397	445.397	859.00	890.52	3998.79
520-520-9144-0000	85498	Varnish - semitransparent	100,292	100.292	191.86	198.90	3966.37
520-520-9114-0000	85431	Waterproofing sealers - clear	568,589	568.589	851.97	883.23	3106.76
520-520-9116-0000	85449	Waterproofing sealers - opaque	47,767	47.767	63.40	65.72	2751.85
520-520-9178-0000	85704	Wood preservatives - clear	157,119	157.119	92.79	96.19	1224.44
520-520-9179-0000	85712	Wood preservatives - semitransparent	138,757	138.757	226.03	234.33	3377.51
		Total - Solvent-Borne Coatings	15,685,996	15,685.996	22,264.69	23,081.79	
520-522-8300-0000	46771	Thinning and Cleanup Solvents **		1,960.75	6,056.05	6,274.40	6400.00

* TOG emissions = ROG emissions / FROG; FROG = 0.9644 (rev.12/00)

** Assume 1 pint (or 0.125 gal) of thinning/cleanup solvent per gallon of solvent-borne coatings; FROG = 0.9652

TABLE II. WATER-BORNE COATINGS
STATEWIDE ANNUAL EMISSIONS

1998 Architectural Coatings Survey Summary (as of 2-26-99)							
EIC	CES	Description	Sales (gals)	**Process Rate (1000 gal)**	ROG Emissions (TPY)	**TOG Emissions (TPY)***	**TOG Emission Factor (lbs/1000 gal)**
520-520-9264-0000	85894	Bituminous	3,623,800	3,623.800	24.83	24.83	13.71
520-520-9265-0000	85902	Concrete curing compounds	399,298	399.298	129.29	129.31	647.68
520-520-9266-0000	85910	Dry Fog	126,241	126.241	60.22	60.23	954.18
520-520-9268-0000	85928	Fire retardant - opaque	45,912	45.912	5.73	5.73	249.69
520-520-9259-0000	85852	Flats	31,800,868	31,800.868	5,267.04	5,267.57	331.28
520-520-9269-0000	85936	Floor	657,393	657.393	216.47	216.49	658.63
520-520-9272-0000	85944	Industrial maintenance	379,074	379.074	132.29	132.31	698.05
520-520-9255-0000	85837	Lacquer - clear	16,766	16.766	6.78	6.78	808.44
520-520-9256-0000	85845	Lacquer - opaque	26,913	26.913	9.16	9.16	680.53
520-520-9273-0000	85951	Metallic pigmented	119,862	119.862	24.59	24.59	410.38
520-520-9261-0000	85860	Nonflats - high gloss	1,618,786	1,618.786	625.99	626.05	773.49
520-520-9263-0000	85886	Nonflats - low gloss	4,440,720	4,440.720	1,095.81	1,095.92	493.58
520-520-9262-0000	85878	Nonflats - medium gloss	15,107,606	15,107.606	3,852.29	3,852.67	510.03
520-520-9200-0000	46755	Other Coatings	463,287	463.287	125.00	125.01	539.68
520-520-9205-0000	85720	Primers, Sealers, and Undercoaters	4,445,524	4,445.524	765.90	765.98	344.61
520-520-9206-0000	85738	Quick dry - Primers, Sealers, and Undercoaters	836,648	836.648	243.21	243.23	581.44
520-520-9274-0000	85969	Roof	2,793,258	2,793.258	73.35	73.36	52.53
520-520-9212-0000	85753	Sanding sealers	5,166	5.166	1.32	1.32	511.67
520-520-9210-0000	85746	Sealers	244,080	244.080	28.19	28.19	231.01
520-520-9232-0000	85787	Stains - clear	74,812	74.812	6.53	6.53	174.62
520-520-9236-0000	85803	Stains - opaque	1,391,817	1,391.817	326.62	326.65	469.39
520-520-9234-0000	85795	Stains - semitransparent	359,292	359.292	170.60	170.61	949.72
520-520-9276-0000	85977	Traffic	1,998,244	1,998.244	616.43	616.49	617.03
520-520-9242-0000	85811	Varnish - clear	172,031	172.031	73.21	73.22	851.24
520-520-9244-0000	85829	Varnish - semitransparent	61,917	61.917	30.53	30.54	986.36
520-520-9214-0000	85761	Waterproofing sealers - clear	403,546	403.546	96.14	96.15	476.53
520-520-9216-0000	85779	Waterproofing sealers - opaque	50,104	50.104	14.65	14.65	584.82
520-520-9278-0000	85985	Wood preservatives - clear	67,123	67.123	12.28	12.28	365.97
520-520-9279-0000	85993	Wood preservatives - semitransparent	7,163	7.163	1.29	1.29	360.44
		Total - Water-Borne Coatings	71,737,251	71,737.251	14,035.76	14,037.16	

* TOG emissions = ROG emissions / FROG; FROG = 0.9998 (rev.12/00)

TABLE III. OTHER COATINGS

1998 Architectural Coatings Survey Summary (as of 3-24-99)							
Category	Description	Total Sales (gals)	SB Sales (gals)	WB Sales (gals)	SB Emissions (TPY)	WB Emissions (TPY)	Total Emissions (TPY)
2	Anti-fouling	PD	PD	0	2	0	2
3	Anti-graffiti	2,573	PD	PD	2	<1	2
5	Bond breakers	PD	PD	PD	<1	12	12
6	Chalkboard resurfacers	PD	0	PD	0	<1	<1
10	Fire retardant - clear	PD	0	PD	0	<1	<1
16	Graphic arts (sign)	40,366	PD	PD	20	<1	20
17	Heat reactive	PD	PD	0	1	0	1
22	Magnesite cement	37,501	PD	PD	92	<1	92
23	Mastic texture	299,727	PD	PD	55	43	98
25	Multi color	40,224	PD	PD	3	24	27
29	Nuclear	697	PD	PD	<1	<1	<1
30	Pre-treatment wash primer	71,940	PD	PD	2	29	31
34	Repair and maintenance thermoplastic	PD	PD	PD	<1	<1	<1
36	Rust preventative	63,099	PD	PD	96	1	97
39	Shellacs - clear	PD	PD	0	75	0	75
40	Shellacs - opaque	PD	PD	0	271	0	271
44	Stains - lows solids	PD	0	PD	0	3	3
45	Swimming pool - general	3,492	PD	PD	6	<1	6
47	Thermoplastic rubber and mastics	PD	PD	PD	<1	1	1
53	Wood preservatives - below ground	3,549	PD	PD	4	1	5
56	Wood preservatives - opaque	PD	PD	PD	<1	<1	<1
57	Wood preservatives - low solids	PD	0	PD	0	1	1
58	Other	205,081	149,950	55,131	190	6	196
	Other* (Aggregated categories not shown above)	245,322	402,335	408,156	<1	4	<1
	Total Other (where applicable)	1,013,572	552,285	463,287	819	125	940
Legend:							
PD =	Protected Data						
NA =	Not Applicable						
* =	Sum of SB & WB breakouts does not equal Total						